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Nabil Fayoumi

05/14/2003 03:42 PM

To: sdsmit, rswill1 cc: mhenry, pbarrett, Sandra.Bron
Subject: Comments for Implementation of Slurry Wall Construction,
Groundwater Migration Control System, Sauget Area 2 Site R.

Steve,

Attached are the U.S. EPA's comments (2 sets) for the Implementation of Slurry Wall Construction, Groundwater Migration Control System at the Sauget Area 2 Site R. The April 24 Technical Memorandum proposes to construct a slurry wall in place of a jet-grouted wall at Site R. Please submit your responses to comments within 21 days of receipt of this e-mail. If you have any questions, please contact me at 312-886-6840.

Sincerely,

Nabil Fayoumi
Remedial Project Manager
Superfund Division



Slurry-Wall-Review-1.dc slurry.ada.503.SA2f

Sauget Area 2 Superfund Site Sites O, Q, R, and S Review of Proposal to Use Soil/Bentonite Cutoff Wall in lieu of Jet-Grouted Cutoff

TO: Nabil Fayoumi/USEPA

FROM: Jim Schneider/CH2M HILL - DEN
Peter Barrett/CH2M HILL - STL

DATE: May 6, 2003

Purpose and Scope

As requested, CH2M HILL performed a brief review of existing information to assess whether or not there were technical concerns with substituting a soil/bentonite cutoff wall (slurry wall) in place of a jet-grouted wall at the Sauget Area 2 Superfund Site. We examined the following information as part of the review:

1. *Implementation of Slurry Wall Construction, Groundwater Migration Control System, Sauget Area 2 - Sites O, Q, R and S, including Attachments A and B.* Solutia. April 24, 2003.
2. Section 2.1.3, *Geology/Hydrology/Hydrogeology of the Focused Feasibility Study, Interim Groundwater Remedy, Sauget Area 2 Sites O, Q, R and S.* Solutia. June 13, 2002.
3. Several miscellaneous drawings, including a boring location plan, four geologic cross-sections, and logs for borings Sonic #2, Sonic #3, and Sonic #4.

Proposed Construction

The April 24 document proposes to construct a slurry wall in place of a jet-grouted wall at the subject site. The wall would be approximately 3300 feet long and would penetrate to the top of bedrock, about 130 to 140 feet deep. A key trench into the top of bedrock is not proposed; rather, it is proposed to clean the bedrock surface with a powered, weighted clamshell. Selected excavated material would be mixed with bentonite and used as trench backfill.

Discussion and Conclusions

Slurry wall technology has evolved to the point where an experienced contractor with the right equipment can construct a slurry wall to the depths required for this project. A contractor such as Inquip or another organization with comparable experience, expertise, and equipment should be able to construct this project as outlined.

The soil conditions are generally favorable for a slurry wall, although caution will have to be exercised as the trench bottom approaches the top of the bedrock due to the downward-

coarsening trend of the grain size. This can be managed by careful monitoring of slurry loss, using a slurry that is viscous enough to prevent sudden loss ("blow-out") into the gravels, and having a contingency plan to provide for rapid backfilling of the lower portion of the trench should blow-out begin. The slurry mix can then be adjusted before excavation continues.

One caution relates to the proposal to complete the slurry wall "directly on top of the rock." My experience in the St. Louis area is that a layer of insoluble chert often occurs at the top of limestone or dolomite bedrock. This chert layer is formed as the limestone or dolomite weather, leaving a layer of the relatively insoluble chert nodules that are typically found in the limestones and dolomites in the St. Louis area. In addition, the top of bedrock can be irregular in shape and depth, sometimes with weathered joints that can be several inches or more wide near the top of bedrock, and may extend many feet deep. Finally, the coarsest material will settle out of the slurry first and accumulate on the bottom of the trench. All of these factors together suggest the potential for a permeable zone at the bottom of the slurry trench unless particular care is taken to thoroughly clean the trench bottom.

The three boring logs reviewed indicate at least some weathered limestone at the top of bedrock in each boring. The powered clamshell should easily be able to penetrate a short distance into this material. We suggest that the specifications be written to require trench bottom cleaning with the clamshell or comparable equipment until the material brought up consists primarily (i.e., more than half) of weathered limestone fragments. This would eliminate the need to perform rock excavation, coring, and repeated measurements to verify formation of a true "key trench," but would result in thorough trench bottom cleaning that should provide a reasonably good seal to most of the bedrock. This would also address the most weathered material around the top of joints as this material would be removed with this cleaning approach. Some weathered joints would probably remain, but as pointed out in the April 24 document, these joints would not have been treated by jet grouting either.

Finally, we note that the last bullet on page 6 of the April 24 document implies that groundwater levels after installation of the barrier will be maintained at a zero gradient. It is suggested that a small inward gradient be maintained once the wall is placed in service. A small inward gradient will limit the potential for offsite contaminant migration; should flow occur, it would be clean water flowing into the site rather than contaminated water flowing out of the site. Also, since gradients can only be measured at discrete locations, maintaining a small inward gradient at those monitoring points helps reduce the potential that unobserved outward gradients might occur at locations between monitoring points. Further, small errors in water level measurements and small survey errors make verification of a true "zero gradient" difficult. We suggest that a small inward gradient, on the order of at least 2 to 6 inches, be maintained. The minimum gradient should be selected once the wall is in place, and should be based on factors such as the range of observed water levels, monitoring point spacing, the observed variation in water levels between adjacent monitoring wells, and similar factors.

Limitations

This report has been prepared solely based on review of the listed materials, and in accordance with generally accepted geotechnical engineering practice. No other warranty, express or implied, is made.

Verification of
0 gradient difficult!
→ "0" gradient
→ Inward gradient
"offsite migration"

May 12, 2003

MEMORANDUM

SUBJECT: Sauget Area 2 Superfund Site, Sauget, IL (02-R05-001)
Implementation of Slurry Wall Construction, Groundwater Migration Control System, Sauget Area 2 - Sites O, Q, R and S

FROM: Steven D. Acree, Hydrogeologist
Randall R. Ross, Ph.D., Hydrogeologist
Applied Research and Technical Support Branch

TO: Nabil Fayoumi, RPM
U.S. EPA, Region 5

As requested, the referenced document has been reviewed by Dr. Randall Ross and me. The proposed excavation equipment appears to be capable of achieving the target excavation depths of 140 feet below land surface. The target hydraulic conductivity value for the wall is not specified in the document. However, hydraulic conductivity values in the 1×10^{-7} cm/s range are commonly attained during the installation of soil-bentonite slurry walls.

The overall effectiveness of the physical barrier will likely be dependant on a number of factors including the extent to which the bedrock is fractured and the resulting hydraulic gradient across the wall. While it may be true that "the amount of groundwater flow through weathered or fractured bedrock is likely to be a very small fraction of the flow in the alluvial aquifer" under existing conditions, as stated in the Focused Feasibility Study, this may change once a vertical barrier is installed. Depending on the hydraulic properties of the rock immediately below the wall, flow below the vertical barrier through the fractured bedrock may become an important issue if significant hydraulic gradients are allowed to develop across the barrier at this depth. Both of the proposed technologies (jet grouting and slurry wall) may suffer from the same limitations with respect to groundwater flow through the bedrock. It is recommended that the monitoring system include piezometers installed in the fractured/weathered bedrock to monitor the hydraulic gradient that develops across the wall.

If you have any questions concerning this evaluation, please do not hesitate to call me at your convenience (580-436-8609). We look forward to future interactions with you concerning this and other sites.

piezometers in the
fractured/weathered bedrock
to monitor hydraulic gradient
that develops across the
wall.

cc: Rich Steimle (5102G)
Larry Zaragoza (5204G)
Luanne Vanderpool, Region 5
Doug Yeskis, Region 5
Randall Ross